

REMARKS

Status of the Claims:

Claims 1 – 8 and 10 – 26 are pending. Claim 1 is amended. Claim 9 is canceled. Claims 22 – 26 are newly added. No claims are withdrawn from consideration.

Claim Amendments:

The claim amendments are made only to expedite prosecution, without prejudice, and without disclaimer of the canceled and/or modified subject matter. The amendments to the claims do not add new matter. The amendment to claim 1 does not add new matter, because the amendment finds support in Figure 1, and the discussion provided on page 6, line 33 – page 7, line 22 of the specification. The amendment to claim 8 does not add new matter, because the word, “preferably,” is deleted from claim 8. The amendment to claim 15 does not add new matter, because the amendment finds support on page 5, lines 26 – 29 of the specification. New claim 22 does not add new matter, because the new claim finds support on page 3, lines 8 – 12 of the specification, which includes all numerical values within the disclosed range. New claim 23 does not add new matter, because the new claim finds support on page 8, lines 16 – 18 of the specification and on page 3, lines 8 – 12 of the specification. New claim 24 does not add new matter, because the new claim finds support on page 3, lines 24 – 26 of the specification, as well as on page 7, line 35 – page 8, line 1 of the specification. New claims 25 and 26 does not add new matter, because the new claims find support on page 8, lines 13 – 25 of the specification

Unexpected Results:

“The ultimate determination of patentability must be based on consideration of the entire record, by a preponderance of evidence, with due consideration to the persuasiveness of any arguments and any secondary evidence.”¹ Since the Office action fails to consider the unexpected results presented in the specification, a proper determination of patentability has not been made. In fact, Applicants respectfully submit

¹ MPEP §716.01(d), citing *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

that the Office action cannot be considered an action on the merits of the present application. In all fairness, the Office action should be withdrawn, and a proper determination of patentability should be made.

More specifically, “[a] greater than expected result is an evidentiary factor pertinent to the legal conclusion of obviousness ... of the claims at issue.”² The claimed invention achieves results that a person of ordinary skill in the art would not have expected at the time the present invention was made. As expressed on page 1, line 26 – page 2, line 25 of the specification, high-temperature (at least 1500°C) reactions with short residence times (1 – 100 ms) with subsequent rapid cooling (occurring within 1 – 100 ms) typically waste energy in order to achieve an economical yield. As expressed on page 3, lines 8 – 12 of the specification, it was surprisingly found that it is possible to carry out a high-temperature reaction with short residence times, and at the same time to cool the hot reaction gas mixture in a first, direct partial quench to a temperature, in the range from 650 to 1200°C, and subsequently indirectly in a second partial quench. By limiting the cooling during the first quench, according to the claimed invention, energy is not wasted, and can be removed in the second quench. As expressed on page 3, lines 28 – 30 of the specification, “[t]he indirect cooling in a heat exchanger in the second quench section can be utilized to generate high-pressure steam, which can be made available for further use or alternatively in order to preheat the starting materials for the reaction.”

The unexpected results presented in the specification should be particularly convincing with respect to the nonobviousness of claims 20 and 21. Claims 20 and 21 require that the high temperature reaction produces acetylene by partial oxidation of hydrocarbons using oxygen. As expressed on page 3, lines 17 – 19 of the specification, “[i]t was known that the decomposition of acetylene is kinetically controlled and thus the cooling rate is decisive for the acetylene losses due to decomposition.” Yet, as expressed on page 3, lines 14 – 17 of the specification, according to the present invention, it was surprisingly found that “compared with the process known from US 2,679,548, a significantly lower cooling is necessary in the first partial quench and thus significantly more heat of reaction is available for the second, indirect partial quench, which can be utilized, for example, for high-pressure steam generation.” As expressed on page 2, lines

² MPEP §716.02(a), citing *In re Corkill*, 711 F.2d 1496, 226 USPQ 1005 (Fed. Cir. 1985).

20 – 21 of the present specification a person of ordinary skill in the art at the time the present invention was made would have expected that, in a process for the preparation of acetylene, the reaction mixture would need to be “immediately cooled to a temperature of at most 600 to 650°C after the reaction by direct quench” Yet, according to the present invention, it was surprisingly discovered, as expressed on page 3, lines 19 – 22 of the specification, that “the reaction can be carried out at a high temperature level and for the cooling in the first, direct quench relatively high maximum temperatures can be permitted without negative effects on the yield.” These unexpected results are precisely commensurate in scope with claims 20 and 21. Moreover, applicants respectfully submit, “one of ordinary skill in the art would be able to determine a trend in the exemplified data which would allow the artisan to reasonably extend the probative value thereof.”³ Thus, the unexpected results are commensurate in scope with claims 1 – 8, and 11 – 26, and establish the non-obviousness thereof.

Allowable claims:

I. Claims 1 – 8, and 11 – 20 are allowable in view of:

- 35 U.S.C §103(a),
- US 4,765,964 to Gravley et al. (hereinafter, “Gravley”), and
- *Ullmann’s Encyclopedia of Industrial Chemistry* (1986 ed.), vol. A5, pp. 144 – 148 (hereinafter, “Ullmann’s”).

II. Claims 8, 10 – 19, and 21 are allowable in view of:

- 35 U.S.C §103(a), Gravley, and
- US 3,640,739 to Bakker (hereinafter, “Bakker”).

III. Claims 8, 10 – 19, and 21 are allowable in view of:

- 35 U.S.C §103(a),
- Gravley,
- Bakker,
- Ullmann’s and
- US 6,349,678 to Toombs et al. (hereinafter, “Toombs”).

³ MPEP §716.02(d), citing *In re Kollman*, 595 F.2d 48, 201 USPQ 193 (CCPA 1979).

Regarding I:

Applicants respectfully submit that “[e]vidence of unexpected results must be weighed against evidence supporting *prima facie* obviousness in making a final determination of the obviousness of the claimed invention.”⁴ Furthermore, applicants respectfully submit that “[t]he rationale to support a conclusion that the claim would have been obvious is that all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination yielded nothing more than predictable results to one of ordinary skill in the art.”⁵ Since the claimed invention yields more than predictable results, it is not obvious. Moreover, Applicants respectfully submit that the Gravley and Ullmann’s cannot even support a *prima facie* case of obviousness.

Claim 1 is directed to a process for carrying out a high-temperature reaction, in which starting materials are supplied to a reaction chamber through channels of a burner block. Gravley column 3, lines 15 – 16 states, “[o]xidant fluid and combustible fluid are introduced into the chamber 10 via the passage 16.” Applicants respectfully submit that passage 16 is not a burner block. Moreover, Gravley does not disclose a burner block. A burner block is a block having a plurality of channels for a uniform distribution of reactant within the reaction chamber. Furthermore, unlike passage 16, a burner block prevents a flashback of flames from the reaction chamber. Again, Gravley only discloses a passage, and does not disclose a burner block. On page 145, Ullmann’s states,

Various types of spraying devices are used to introduce the feedstock into the reaction zone. An axial oil injector with a spraying nozzle at its tip, which usually produces a hollow-cone spray pattern, is a commonly used device. One- and two-component atomizing nozzles are in use, air and steam being the preferred atomizing agents in the latter case. However, the feedstock is injected into some reactors as a plurality of coherent streams into the accelerated combustion gases perpendicular to the direction of stream.

⁴ MPEP §716.02(c), citing *In re May*, 574 F.2d 1082, 197 USPQ 601 (CCPA 1978).

⁵ MPEP §2143, citing *KSR*, 550 U.S. at ___, 82 USPQ2d at 1395; *Sakraida v. AG Pro, Inc.*, 425 U.S. 273, 282, 189 USPQ 449, 453 (1976); *Anderson's-Black Rock, Inc. v. Pavement Salvage Co.*, 396 U.S. 57, 62-63, 163 USPQ 673, 675 (1969); *Great Atlantic & P. Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147, 152, 87 USPQ 303, 306 (1950) (emphasis added).

Applicants respectfully submit, therefore, that Gravley and Ullmann's disclose supplying the starting materials with injectors or through passages, and neither reference discloses using a burner block having a plurality of channels. Applicants respectfully submit, therefore, that the combination of Gravley and Ullman's does not support a *prima facie* case of obviousness with respect to claims 1 – 8 and 10 – 26.

Claim 1 also requires the reaction mixture to be subsequently rapidly cooled in a quench area, characterized in that in the quench area firstly a direct cooling to a temperature in the range from 650°C to 1200°C takes place by supply of an evaporating quench medium and subsequently an indirect cooling in a heat exchanger takes place. Gravley column 6, lines 37 – 39 merely states, “[t]he pyrolysis zone 8 is further provided with a means 56 for supplying cooling fluid to the reaction flow passage.” Thus, at page 4, lines 7 – 9, the Office action recognizes that “Gravley does not disclose wherein the direct cooling results in a lowering of the temperature to the range from 650°C to 1200°C nor that such direct cooling is followed by indirect cooling in a heat exchanger.”

First, applicants agree that Gravley does not disclose direct cooling to a range of from 650°C to 1200°C. Moreover, on page 146, Ullmann's states,

reactors of modern furnance plants, vary considerably in shape, flow characteristics, and the manner in which fuel and feedstock are introduced. Nevertheless, they all have the same basic process steps in common: producing hot combustion gases in a combustion chamber injecting the feedstock and rapidly mixing it with the combustion gases, vaporizing the oil, pyrolyzing it in the reaction zone, and rapidly cooling the reaction mixture in the quenching zone to temperatures of 500 – 800°C.

New claim 22 depends from claim 1 and further requires that the direct cooling takes place to a temperature in the range from greater than 800°C to 1200°C. New claim 23 depends from claim 1 and further requires that the direct cooling takes place to a temperature in the range from 850°C to 1200°C. Applicants respectfully submit that the combination of Gravley and Ullman's does not support a *prima facie* case of obviousness with respect to new claims 22 – 23.

Second, new claim 24 depends from claim 1 and further requires that the

evaporating quench medium evaporates completely. Applicants respectfully submit that the combination of Gravley and Ullman's does not support a *prima facie* case of obviousness with respect to new claim 24.

Third, applicants respectfully note that, at column 6, lines 54 – 56, Gravley states, “[f]urther downstream of the quench means 56, the reaction mixture is further cooled to facilitate handling, and can be processed in conventional equipment.” Applicants respectfully submit that the amendment to claim 1 clarifies that the process is carried out in a reactor comprising a reaction chamber and a quench area, and that both direct and indirect cooling occurs within the quench area. Neither Gravley nor Ullmann's disclose a reactor having a quench area comprising both a direct cooling and an indirect cooling. Applicants respectfully submit, therefore, that the combination of Gravley and Ullman's does not support a *prima facie* case of obviousness with respect to new claims 1 – 8 and 10 – 26.

Claim 11 further distinguishes over Gravley and Ullman's by requiring that the transition of the reaction chamber to the quench area is designed in the form of a gap. Claims 12, and 13 further distinguish over Gravley and Ullman's by requiring that the transition of the reaction chamber to the quench area is designed in the form of an annular gap. The word “annular” means “ring-shaped.” Applicants respectfully submit that since Gravley and Ullman's do not describe a transition from a reaction chamber to a quench area that is designed in the form of a gap or in the form of an annular gap, Gravley and Ullman's cannot support a *prima facie* case of obviousness with respect to claims 11 – 13.

Regarding II:

Applicants respectfully submit that claims 8, 10 – 19, and 21 are allowable in view of 35 U.S.C §103(a), Gravley, and Bakker. As discussed above, since the claimed invention yields more than predictable results, it is not obvious.

Bakker is not cited to compensate and does not compensate for the shortcomings described above regarding I. Thus, applicants respectfully submit that Gravley and Bakker cannot support a *prima facie* case of obviousness.

Moreover, claim 8 requires that all the surfaces restricting the reaction chamber are formed using a fire-resistant ceramic stable at reaction temperature having an alumina content of at least 80% by weight, characterized in that the fire-resistant ceramic is introduced into the reaction chamber in the form of stones or blocks or as a cast or tamped mass and subsequently compressed, dried and calcined. The amendment to claim 8 makes clear that the calcining process necessarily (as opposed to preferably) takes place owing to the high temperature reaction. Gravley and Bakker do not disclose this feature.

Additionally, at column 1, lines 62 – 67, Bakker explains, “[i]t is among the objects of this invention to provide high alumina refractories ... which may be produced ... by practices which are customary in the refractory trade.” Applicants respectfully submit that claim 8 does not describe a practice that is customary in the refractory trade.

Furthermore, at column 3, lines 58 – 59, Bakker makes clear, “[t]he tempered mix is then pressed into the desired refractory brick shape.” At column 3, lines 59 – 61, Bakker immediately clarifies, “[i]t should be noted that the term ‘brick’ is used in its generally accepted meaning in the refractory art.” Applicants respectfully submit that claim 8 of the present application is not related to a brick-shaped refractory, and that the modification required to arrive at the claim features would render the Bakker brick-shaped refractory unsuitable for its intended purpose as a brick-shaped refractory.

Finally, at column 3, lines 64 – 66, Bakker explains, “[g]enerally, pressing of the brick necessitates a pressure of at least about 4,000 p.s.i. which may range up to about 15,000 p.s.i.” Applicants respectfully submit that neither Gravley nor Bakker provide any teaching that would enable a person of ordinary skill in the art to meet this requirement after making the proposed modification.

Regarding IIII:

Applicants respectfully submit that claims 8, 10 – 19, and 21 are allowable in view of 35 U.S.C §103(a), Gravley, Bakker, Ullmann’s, and Toombs. First, as discussed above, since the claimed invention yields more than predictable results, it is not obvious.

Second, Toombs is not cited to compensate and does not compensate for the shortcomings described above regarding II.

Third, regarding claims 20 and 21, which require that the high temperature reaction produces acetylene by partial oxidation of hydrocarbons using oxygen, applicants respectfully submit that neither Gravley nor Toombs provide any hint that the Gravely process for producing carbon-black can be used to produce acetylene. Toombs merely states, “[t]he tailgas produced as a byproduct of carbon black manufacture is typically composed of ... [less than 1%] acetylene and higher hydrocarbons.”⁶ Toombs in no way indicates that every process for manufacturing carbon black necessarily yields trace amounts of acetylene. Thus, Toombs cannot be relied upon to establish that trace amounts of acetylene would necessarily be produced according to the Gravley process. “To establish inherency, the extrinsic evidence ‘must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.’”⁷ Thus, “[i]n relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.”⁸ Since Toombs does not establish that the trace amounts of acetylene produced according to the Toombs process are necessarily produced according to the Gravley process, Gravley, Bakker, Ullmann’s, and Toombs cannot support a *prima facie* case of obviousness.

Finally, applicants respectfully submit that new claims 25 and 26, which require the acetylene yield to be about 29% based on carbon, are allowable in view of 35 U.S.C §103(a), Gravley, Bakker, Ullmann’s, and Toombs.

Fee Authorization:

Please charge any shortage in fees due in connection with the filing of this paper, including any shortage in Extension of Time fees, to Deposit Account 14.1437. Please credit any excess fees to such account.

⁶ Column 1, lines 24 – 34 of US 6,349,678 to Toombs et al.

⁷ MPEP §2112, citing *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999).

⁸ *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original).

Conclusion:

The present application is in condition for allowance, and applicants respectfully request favorable action. In order to facilitate the resolution of any questions, the Examiner is welcome to contact the undersigned by phone.

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Respectfully submitted,
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A handwritten signature in black ink, appearing to read "Michael P. Byrne". The signature is fluid and cursive, with a long horizontal stroke at the end.

Michael P. Byrne
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